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SYCAMORE DECLINE SURVEY

PROGRESS REPORT

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FOREST INSECT AND DISEASE MANAGEMENT

ASHEVILLE, N. C.

Economic pressures in the last decade and the fast growth of American sycamore, Platanus occidentalis L., has stimulated interest in intensively managed sycamore plantings for pulp production across the South. American sycamore has generally had no major lethal disease problems. However, a sycamore decline and dieback syndrome of uncertain origin which can result in mortality and may pose a serious threat in some locations was noted in a Louisiana sycamore plantation in 1971. In 1973 a survey was made of 26 sycamore plantations in the Mississippi Delta for canker, leaf scorch, and dieback. (Filer, et. al., 1975) All stands showed leaf scorch with average percent per tree ranging from 22% to 88%. Average percent dieback was as high as 42%. Mortality due to cankers was as high as 9.5% in 1973. At one location 20% of the trees died over a two year period.

Because the cause has not been definitely determined and the distribution of the disease is unknown, the Southern Forest Tree Improvement Committee recognized the need for a comprehensive survey to determine the range, intensity, and organisms associated with sycamore decline symptoms. This information is desired by forest managers in order to make clear decisions on future investments in sycamore plantings, research pathologists who are uncertain as to allocation of scarce research dollars, and especially tree improvement specialists interested in sycamore genetics. In response to these needs, the Asheville Field Office of Forest Insect and Disease Management in cooperation with the Alexandria Field Office and The Southern Hardwoods Laboratory, will direct a distribution, intensity, and associated organism survey of sycamore decline across the South in August and September, 1977. The survey will include both natural stands and sycamore plantations.

Sycamore decline symptoms include leaf scorch, twig and branch dieback, and trunk cankers. Symptoms of this general nature have been reported in city plantings (Siggers, 1938) and natural stands (Toole, 1961) in the Mississippi Delta area as well as plantations. Seven fungi have been associated with these symptoms in plantations (Cooper, et. al., 1976). Three, Phomopsis scabra (Sacc.) Trav., Phyllosticta plantani Sacc. & Speg., and two conidial stages of the sycamore anthracnose fungus, Gloeosporium nervisequum (Fckl.) Sacc. and G. platani Edg., were isolated only from leaves or twigs. Phyllosticta plantani (Wolf, 1938) and sycamore anthracnose (Himelick, 1961) can cause leaf necrosis. The anthracnose fungus as well as Phomopsis spp. (Hepting, 1971) infect small twigs and can cause twig dieback. These fungi do cause some decline in vigor.

Trunk cankers, however, are likely responsible for the severe dieback and mortality observed recently in plantations. Sunken bark with darkened dead cambium underneath and little or no callus formation are characteristic. Four fungi, Dothiorella gregaria Groos & Dug, Hypoxylon tinctor (Berk.) Cke., Ceratocystis fimbriata Ellis & Halst., and Botryodiplodia theobromae Pat., have been isolated from trunk cankers in plantations. (Cooper, et. al., 1976) Dothiorella gregaria causes a dieback of at least 50 woody plant species (Westcott, 1960) including a serious dieback of redbud. Hepting (1971), however, identifies it as only weakly parasitic and largely saphrobic on sycamore. Hypoxylon tinctor was found to be associated with trunk cankers in Louisiana (U.S.D.A., 1960) and in the Georgia Piedmont. (McAlpine, 1961) No studies have been made to determine pathogenicity.

Botryodiplodia theobromae and Ceratocystis fimbriata are the prime suspects for the lethal cankers observed in plantations. (Cooper, et. al., 1976) Ceratocystis fimbriata caused a serious problem called canker-stain of urban London plane trees (Platanus acerifolia (Ait.) Willd.) and American sycamore from about 1926 to 1949. (Mook, 1940; Mook, 1941; Walter, 1946; Walter, et. al., 1952) City trees in Mississippi, Kentucky, Tennessee, Virginia, North Carolina, West Virginia, Pennyslvania, Maryland, Delaware, and New Jersey died as a result of this fungus. Mortality rates were as high as 81% over the 23 year period in New Jersey (Walter, 1952) and 10,000 sycamore trees died in Philadelphia. (Walter, 1946) Because the fungus was spread via contaminated pruning tools, the incidence of this disease was drastically reduced

when sterilization of pruning tools became a common practice. Indeed, only one-half of one percent of American sycamores in natural stands where pruning was not done were found to be infected in 1941. (Mook, 1941)

Botryodiplodia theobromae has been noted in natural stands near Athens, Georgia (Thompson, 1951), and in the Mississippi Delta. (Filer, 1969) In one stand near Athens, 40% of the trees were infected and some of these infected trees were killed. B. theobromae is said to cause cankers of sycamore across the South but to be more prevalent in the Mississippi Delta. In natural stands the fungus is a cause of some losses on poor sites, but is not a serious problem. (Filer, 1965) However, losses in sycamore plantations due to this fungus may be greater.

Forty-five sycamore plantations will be examined for leaf scorch, dieback, and cankers. The majority of sycamore plantings have been made on an experimental basis by persons with interest in tree improvement. Therefore, hardwood tree improvement groups have been asked to refer organizations which have planted sycamores. Bob Kellison, the director of the North Carolina State University Hardwood Research Cooperative, an organization which encompasses tree improvement interests west to the Mississippi River and Bill Lowe, head of the Western Gulf Forest Tree Improvement Cooperative Program, an organization of tree improvement groups west of the Mississippi, have provided lists of their members involved in sycamore plantings (Table 1). These members have been asked to submit a list of their sycamore plantings which are at least 3 years old and 3 acres in size.

Since regional and age differences in disease incidence may exist, plantations will be stratified into 3 regions (upper Mississippi Valley area, lower Mississippi Valley area, and piedmont and eastern coastal area) and three age groups (3-5 years, 6-8 years, and 9 years and older). A sample of 48 stands will then be chosen to represent the total acreage of sycamore plantings reported by the tree improvement cooperators and, if possible, the regions and age groups outlined above with 5 plantations of each age group in each region.

Eighteen natural stands will be examined for leaf scorch, dieback, and cankers. The sample population will include all stands on national forest land classified in the U.S.F.S. Continuous Inventory System as river birch, sycamore type or sycamore, pecan, American elm type.

Table 1: Members of the North Carolina State University Hardwood Research Cooperative and the Western Gulf Forest Tree Improvement Cooperative Program involved in planting sycamore.

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Bill Lowe
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Table 2 shows the national forests on which these timber types occur and the acreage of each type. Since regional differences and site differences may exist, (Filer, 1965 the stands will be stratified by the same three regions as plantations and also by site index. Three stands with site index less than 90 and three with site index greater than 90 will be randomly selected from each region.

The second stage of the sampling scheme will involve variable plot samples with a basal area prism with a BAF of 10 in natural stands and 5 in plantations. DBH and species of each tree will be recorded to the nearest inch. Leaf scorch will be recorded for each sycamore as very little (0-25%), light (25-50%), moderate (50-75%), or heavy (75-200%). The crown of each sycamore tree will be classified as having light, moderate, or heavy dieback. Only the top 2/3 of the crown will be considered in making this determination. A tree will be classified into the light dieback category if less than 25% of the branches are dead, the crown is full (i.e. branches have many small twigs other than epicormic twigs), and leaves are of normal size over at least 50% of the crown. A tree in the moderate dieback category will have 25-50% dead branches, leaves of less than normal size over at least 50% of the crown, or a sparse crown (i.e. few small twigs other than epicormics). To be classified in the severe dieback category a tree must have more than 50% of the branches dead.

Each sycamore tree will be examined for diffuse cankers. Signs of canker causing fungal infection include red to brown discoloration of the bark, sunken or sloughed bark, and dead cambium under bark scales.

A section of cambium and wood from the edge of the first ten cankers found in each stand will be removed and immediately stored in an ice chest for transport to the Asheville Insect and Disease Management Laboratory. Sections of wood will be removed aseptically and placed on plates of commercially available PDA and PDA made from sweet potatoes, incubated for 4 weeks, and examined for Ceratocystis fimbriata and Botryodiplodia theobromae.

The survey will be conducted by 4 crews of two people from August 22 to September 9, 1977. Two crews will be from the Asheville Field Office, one from the Alexandria Field Office, and one from the Southern Hardwoods Laboratory. Training sessions for all crew members will be conducted during the week of August 1-5. Data will be analized and summarized by the Asheville Field Office.

Table 2: Acres of River Birch-Sycamore Type and Sycamore-Pecan-American Elm Type in the National Forests of Thirteen Southern States.

National Forest	River Birch-Sycamore	Sycamore-Pecan-American Elm
Upper Mississippi Valley Area		
Holly Springs	49	
Tombigbee		77
Ozark		10
St. Francis		940
Lower Mississippi Valley Area		
Kisatchie	529	14
Homochitto		154
Davy Crockett		83
Piedmont and Eastern Coastal Area		
Oconee		149
Sumter	1753	
Cherokee	27	
George Washington	184	

The survey plan is being written by Sue Hubbard, pathologist, Asheville Field Office with the assistance of Ted Filer and Francis McCracken, pathologists, Southern Hardwoods Laboratory, Stoneville, Mississippi. Statistical assistance is being provided by Bob Uhler, Pest Management, Atlanta, Georgia.

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